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GB 2231647 A US 4777734 A US 4017982 A

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Online databases:WPI

(54) Drying filled cans

(57) Residual surface moisture is removed from washed articles, such as filled beverage containers 2 by passage through an enclosure 10, where air blast nozzles 15 displace it as droplets which form a suspension in the air within the enclosure. The nozzles 15 are so placed that the jets of air issuing from them are applied to areas where moisture is trapped, and entrain ambient air to strip the trapped moisture. Suction devices 23 remove the suspension.

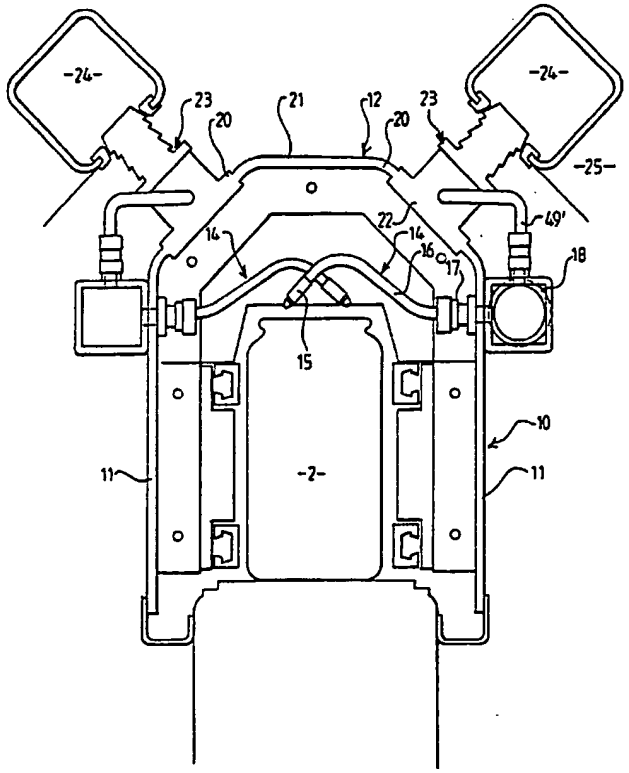

FIG 5

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

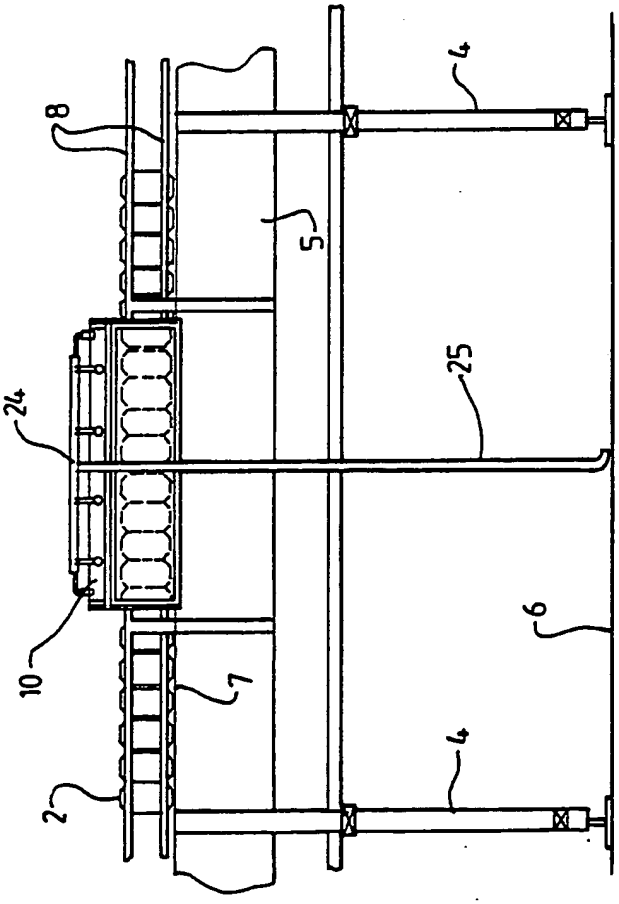

FIG 3

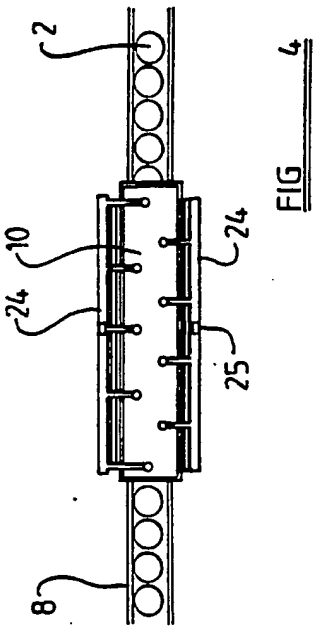

FIG 4

FIG 2

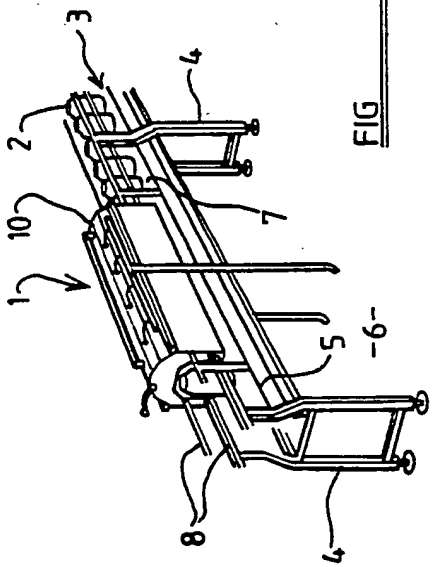

FIG 1

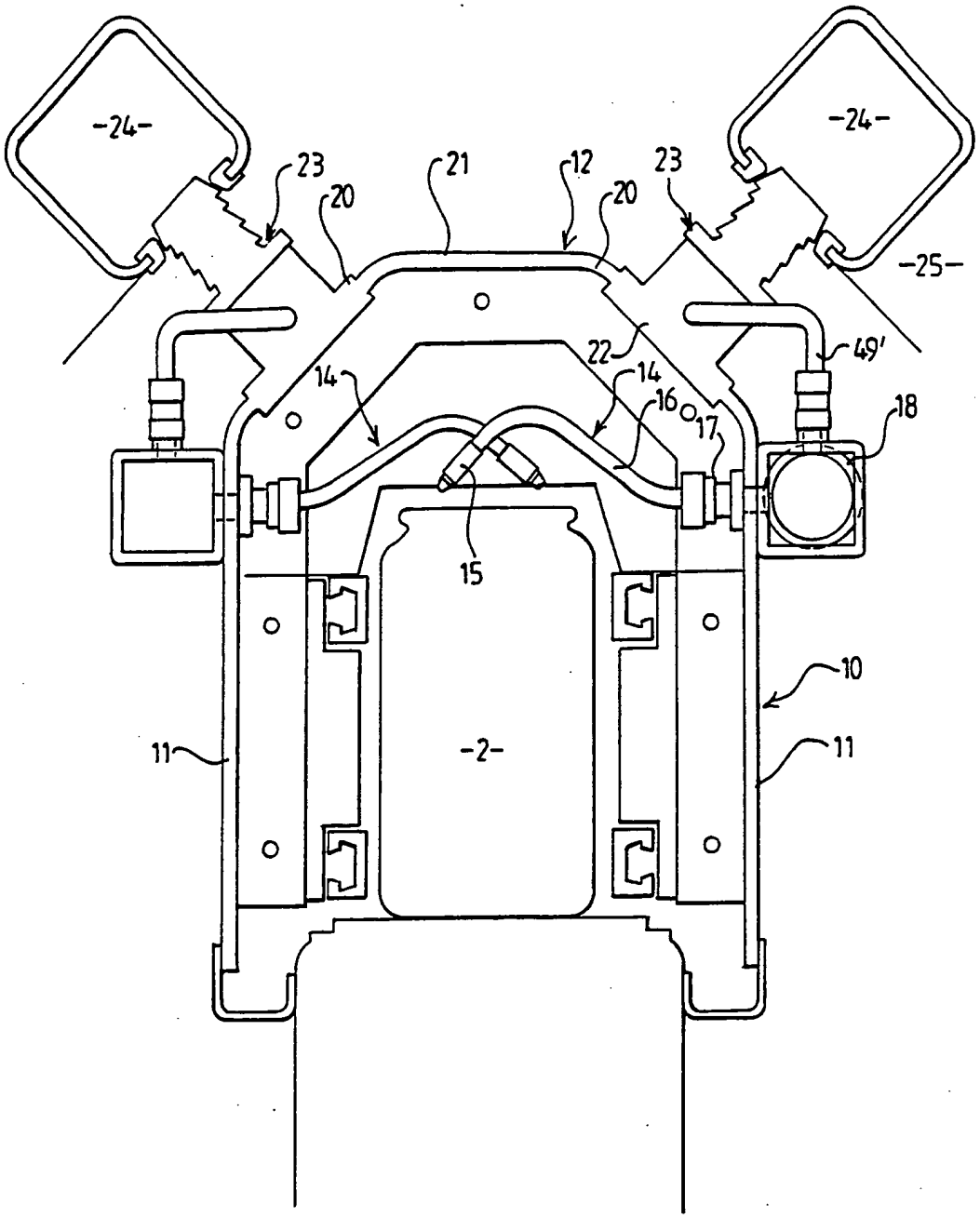

FIG 5

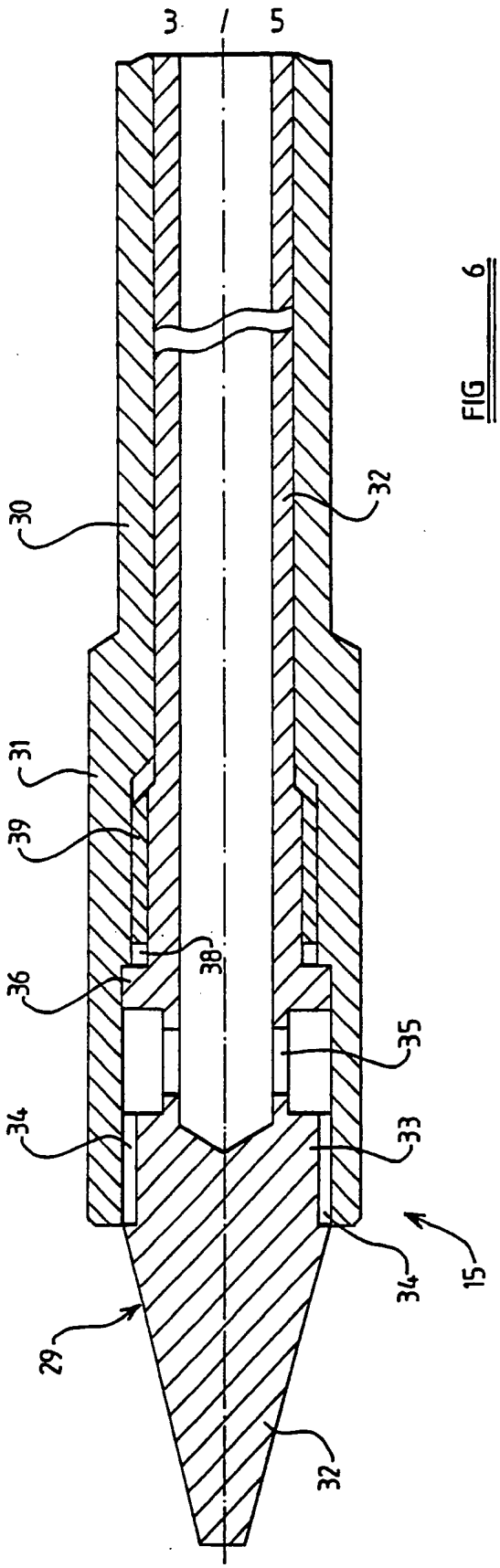

FIG 6

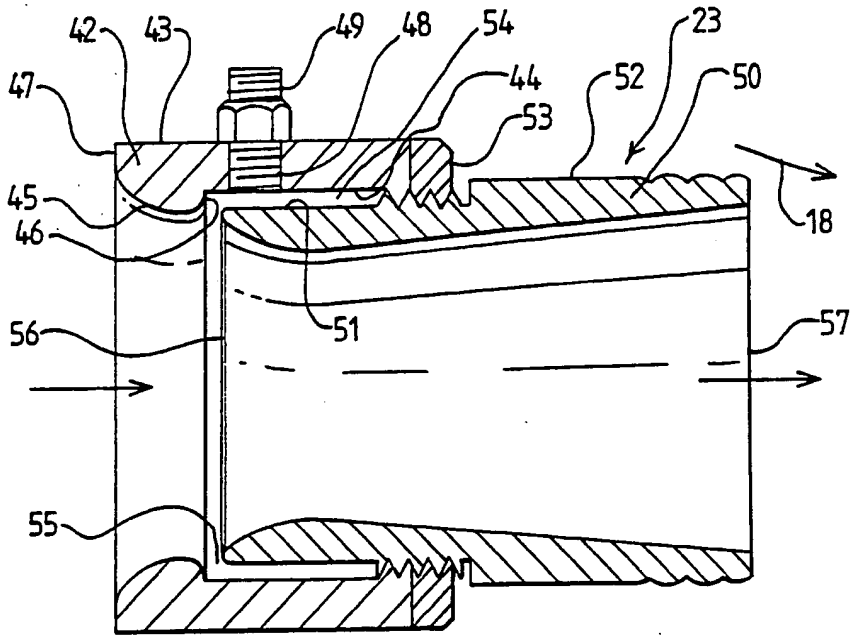

FIG 7

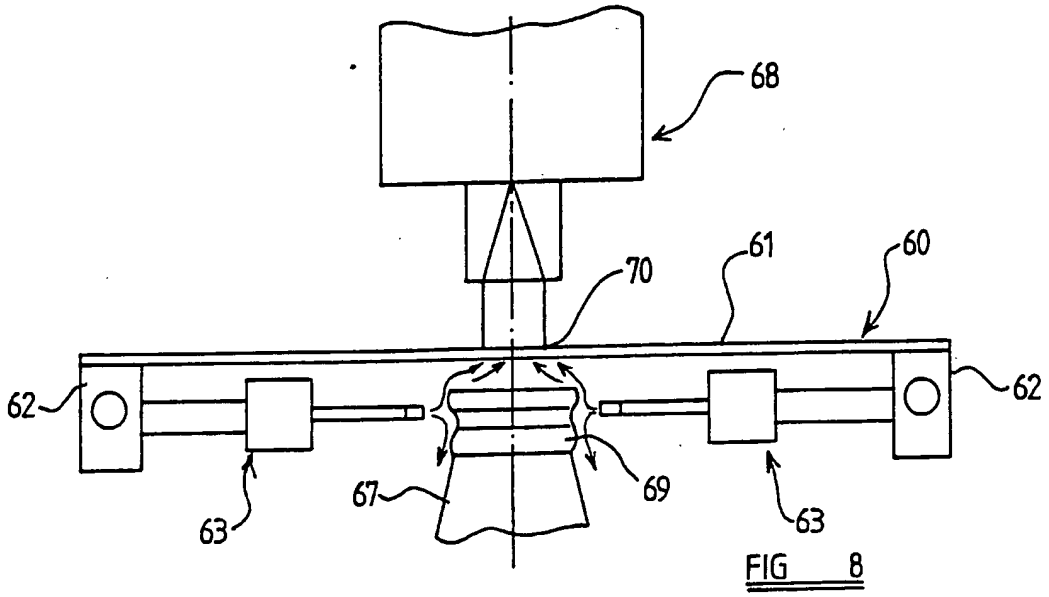

FIG 8

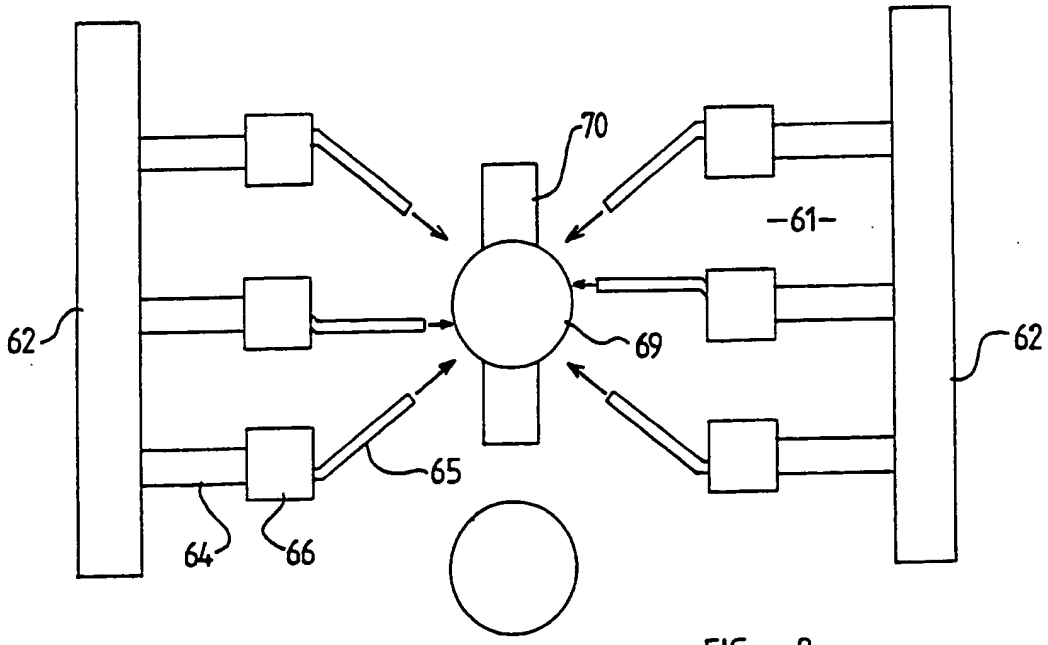

FIG 9

PATENTS ACT 1977

Description of Invention
"Article Drying Method and Apparatus"

This invention concerns improvements in or relating to the drying of articles as they are transported on a conveyor. In particular, the invention relates to a method and apparatus for drying conveyed articles having residual moisture on a surface thereof.

A processing plant for filling containers such as cans, jars and bottles typically includes a production line on which the containers are filled, washed, dried and then packaged on a tray enclosed in shrink wrap sheet material. Such articles are typically transported between the washing stage and the packaging stage on a container at relatively high speed, for example at a rate of 1500 articles per minute. A known drying stage interposed between the washing and wrapping stages comprises air jet means for directing a downwardly orientated jet or jets of air onto the articles travelling on the conveyor in order to dislodge residual moisture from the outer surface of the container, particularly the top of a can or the closure of a jar or bottle which tend to form moisture traps and which are often susceptible to corrosion if packaged in a damp condition. The known drying stage simply blows the residual moisture off the surfaces of the container in a direction such that it can be deposited on downstream containers and on the conveyor, thereby leading to a build-up of moisture at the level of the conveyor.

The existing drying stages in such processing plants frequently fail to remove the moisture from the corrodable parts of the container effectively with the result that the moisture is trapped under the shrink wrap material during packaging. This can lead to an

unacceptable level of relatively rapid corrosion of the containers and result in unacceptable levels of product rejection.

It is an object of the present invention to provide a method and apparatus for efficiently removing residual surface moisture from articles travelling on a conveyor.

Accordingly, in one aspect, the present invention provides a method of removing residual surface moisture from articles travelling on a conveyor, including positioning a drying enclosure above a drying portion of the conveyor at least partially to enclose articles travelling along the drying portion of the conveyor, directing a jet of air onto a surface of the enclosed portion of an article travelling through the enclosure to displace moisture from the surface in the form of droplets which form a suspension in the air within the enclosure, and withdrawing the suspension from the enclosure.

In another aspect the present invention provides a drying apparatus for removing residual surface moisture from articles travelling on a conveyor, including an enclosure for positioning above a drying portion of the conveyor at least partially to enclose articles travelling along the drying portion of the conveyor, means for directing a jet of air onto a surface of the enclosed portion of an article travelling through the enclosure to displace moisture from the surface of the article in the form of droplets which form a suspension in the air within the enclosure, and means for withdrawing the suspension from the enclosure.

In order that the invention may be more readily understood, embodiments thereof will now be described, by

way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of one embodiment of a drying apparatus embodying the present invention installed on the conveyor of a processing plant for filling cans.

Figure 2 is a side view of the drying apparatus of Figure 1;

Figure 3 is an end view of the drying apparatus of Figure 1;

Figure 4 is a plan view of the drying apparatus of Figure 1;

Figure 5 is a more detailed and partly sectioned end view of a drying enclosure of the drying apparatus of Figure 1;

Figure 6 is a cross-sectional view of an air jet nozzle employed in the drying apparatus of Figure 1;

Figure 7 is a cross-sectional view of a suction unit employed in the drying apparatus of Figure 1;

Figure 8 is a schematic end view of another embodiment of a drying apparatus embodying the present invention; and

Figure 9 is a schematic underneath plan view of the drying apparatus of Figure 8.

Referring firstly, to Figure 1, a first embodiment of a drying apparatus 1 according to the invention is shown, by a way of example, applied to the drying of filled and closed cans 2 travelling on a conveyor 3 towards a packaging station (not shown) at which the cans 1 are packed in cardboard trays and covered with shrink wrap film.

The cans arriving at the drying apparatus 1 have been filled, closed and washed. The cans 2 carry residual moisture, primarily trapped on the top surface of the can which has an encircling lip and often a ring-pull device for opening the can. Such residual moisture can lead to undesirable and unsightly corrosion of the top of the can if this moisture is not efficiently removed before the cans are packaged.

The conveyor 3 on which the cans are transported comprises stands 4 supporting a stringer 5 at intervals above a floor 6. A conveyor belt 7 is mounted on the stringer 5, the cans travelling on the belt 7 between two horizontally spaced guides each formed by a pair of vertically spaced guide rails 8.

As shown in Figures 1 to 5, the drying apparatus 1 comprises an enclosure 10 having an open bottom, which enclosure is positioned above a drying portion of the conveyor belt 7, so that vertical side walls 11 of the enclosure enclose a length of the conveyor belt and the corresponding guide rails. The enclosure 1 comprises a domed top 12 which defines an enclosed chamber above the cans travelling through the enclosure 10. The domed top 12 of the enclosure comprises a pair of sloping walls 20 interconnected by a horizontal top wall 21.

Two sets of adjustable air jets 14 are mounted at the top of the side walls 11 of the enclosure 10. The jets of 14 of each set are spaced apart along the length of the enclosure 10 and the jets of the two sets are staggered relative to one another. Each air jet 14 of each set comprises a Coanda effect nozzle 15 carried at one end of a flexible hose 16 which is connected via a coupling 17 mounted on the corresponding side wall to an associated pneumatic manifold 18 which is supplied with compressed air.

Each of the sloping walls 20 of the domed top of the enclosure 10 is formed with a series of outlet openings 22 which constitute the inlets of respective Coanda effect suction units 23 the outlets of which are connected to a corresponding discharge manifold 24. A discharge pipe 25 extends downwardly from the manifold 24 to the floor 6.

The nozzle 15 of an air jet 14 is shown in more detail in Figure 6. The device 15 comprises a hollow body 31 from which extends an integrally formed externally ribbed hollow shank 30 the free end of which is sealingly inserted in the flexible hose 16. The hollow body 31 receives an insert 29 which comprises a hollow spindle 32 connected to a solid head comprising a cylindrical portion 33 and a conical tip 32, the cylindrical portion 33 being formed with axially extending ribs 34. A portion of the hollow spindle 32 next to the cylindrical head portion 33 is formed with a radial bore 35 which connects with the interior of the hollow spindle 32. A threaded portion 38 of the spindle 32 engages an internally threaded portion 39 of the body 31 and an annular collar 36 is formed on the spindle 32 to isolate the radial bore 35 from the interior of the hollow body 31. In operation, compressed air supplied to the ribbed shank 30 of the nozzle 15 through

the flexible hose 16 passes through the hollow spindle 32 of the insert 29 and emerges through the bore 35. The air is then discharged through the axial passages defined between the ribbed cylindrical portion 33 of the head of the insert 29 and the inner cylindrical surface of the body 31. As a result of the Coanda effect, the compressed gas emerging from the axial passages tends to adhere to the nearest surface, namely the conical tip 32 of the insert head and moreover entrains ambient air to form a concentrated jet of air.

The detailed construction of a suction unit 23 is shown in Figure 7, where the unit 23 is shown as comprising an outer tubular member 42 having a cylindrical external surface 43 and an internal surface comprising a main cylindrical section 44 and a profiled section 45 which forms a radial annular step 46 at its junction with the cylindrical main section 5. The profiled surface section 45 flares towards an inlet or upstream end 47 of the outer member 42. A radial bore 48 extends through the outer member 42 from its external surface to the internal cylindrical surface section 44 and is threaded to receive a compressed air connector 49 for connection to a compressed air line 49' (see Figure 5).

An inner tubular member 50 of the unit has an external surface formed by a smaller diameter cylindrical section 51 and a larger diameter cylindrical section 52 which meet at a radial annular step. The smaller diameter external surface section 51 of the inner tubular member has a smaller diameter than the diameter of the cylindrical outer surface section 44 of the member 42 and is received within the main section 44 of the outer member, the members 42 and 50 being secured together by a locking ring 53. An axially extending cylindrical chamber 54 is thereby defined

between the members 42 and 50, the chamber being closed at the end of the outer member 42 by ring 53 and communicating with the radial bore 48 in the outer member.

A narrow annular orifice 55 is defined between the inserted end 56 of the inner member 50 and the annular shoulder 46 in the inner surface of the outer member 42. The internal surface of the inner member 50 is profiled so as first to narrow in the direction away from the end 56 and then flare towards the other end 57 of the member 50, thereby forming a venturi configuration with a constriction downstream of the orifice 55 in the flow passage through the unit.

When compressed air is supplied through the bore 48 to the cylindrical chamber 54 between the inner and outer members, the compressed air emerging from the chamber 54 through the annular orifice 55 tends to adhere to the inner profiles of the members 42 and 50, thereby creating a partial vacuum within the unit and inducing a flow of air axially through the unit with the air entering at the inlet end 47 of the outer member 42 and leaving at the outlet or downstream end 57 of the inner member 50. A secondary flow of air around the device is also entrained by the emerging air stream leaving the end 57 of the inner member as shown schematically by arrows 58.

In operation of the above described drying apparatus embodying the invention, the air jets 14 are positioned within the enclosure 10 to direct jets of air onto the top of the cans 2 as they pass through the enclosure 10, so as to displace any residual moisture from the top of the cans into the air above the cans. The moisture displaced by the air jets 14 forms a mist or suspension of small liquid droplets in the air contained in

the enclosure 10 above the cans. This suspension is continuously withdrawn from the chamber above the cans by the suction devices 23 and discharged at the level of the floor 6 through the manifolds 24 and downpipes 25, thereby completely removing the moisture from the level and immediate environment of the conveyor and preventing it being re-deposited on the cans or the conveyor belt 7. The cans 2 emerging from the enclosure 10 are thus completely dry and can be safely packaged.

Figures 8 and 9 show, in simplified form, a second drying apparatus embodying the present invention for use in drying bottle closures, such as crown corks which are prone to corrosion if packed with residual moisture.

In the case of Figures 8 and 9, the drying apparatus comprises a simple enclosure 60 in the form of a cover comprising a top plate 61 bridging a pair of compressed air manifolds 62 from each of which extend three air jets 63. Each air jet comprises a compressed air feed pipe 64 supplying compressed air to an adjustable nozzle 65 via a nozzle mount 66. The air jets 65 are positioned to direct jets of air from different directions onto the closure 69 of a bottle 67 travelling on a conveyor (not shown) below the enclosure 60 with its closure 69 passing through the enclosure 60 between the opposed jets 65 of the drying apparatus.

A suction device 68, which is preferably of the kind described with reference to Figure 7 is positioned above the plate 61 and has its inlet connected to a discharge opening 70 formed centrally in the plate 61.

In operation of the apparatus shown in Figures 8 and 9, the air jets 65, which are desirably of the form

shown in Figure 6, direct jets of air from respective directions onto the closure 69 of the bottle 67 to ensure comprehensive removal of residual moisture on the bottle closure. The moisture displaced from the bottle closure forms a suspension of droplets within the enclosure 60 below the plate 61 and this suspension is withdrawn from the enclosure by the suction device 68 and deposited at a remote location as in the case of the first embodiment.

CLAIMS:

1. A method of removing residual surface moisture from articles travelling on a conveyor, including positioning a drying enclosure above a drying portion of the conveyor at least partially to enclose articles travelling along the drying portion of the conveyor, directing a jet of air onto a surface of the enclosed portion of an article travelling through the enclosure to displace moisture from the surface in the form of droplets which form a suspension in the air within the enclosure, and withdrawing the suspension from the enclosure.

2. A drying apparatus for removing residual surface moisture from articles travelling on a conveyor, including an enclosure for positioning above a drying portion of the conveyor at least partially to enclose articles travelling along the drying portion of the conveyor, means for directing a jet of air onto a surface of the enclosed portion of an article travelling through the enclosure to displace moisture from the surface of the article in the form of droplets which form a suspension in the air within the enclosure, and means for withdrawing the suspension from the enclosure.

3. A drying apparatus according to claim 2, wherein the enclosure defines above the articles travelling through the enclosure a chamber in which the suspension is formed and from which the suspension is withdrawn.

4. A drying apparatus according to claim 2 or 3, wherein the air jet means comprises a Coanda effect nozzle.

5. A drying apparatus according to claim 4, wherein the nozzle comprises an insert received in a hollow body to

which compressed air is supplied, the insert having a hollow spindle through which the compressed air is supplied to a chamber defined in the hollow body behind a head of the insert, the compressed air emerging from the chamber through channels defined between a cylindrical portion of the head and the internal surface of the hollow body and travelling along a conical tip of the head to form a jet.

6. A drying apparatus according to any one of claims 2 to 5, wherein the means for withdrawing the suspension from the enclosure comprises a Coanda effect air moving unit having its inlet connected to an outlet formed in the enclosure.

7. A drying apparatus according to claim 6, wherein the Coanda effect air moving unit comprises a tubular unit having an internal surface which defines a flow passage through the unit and is profiled to define a venturi in the flow passage, passage means being formed in the unit for connection to a supply of compressed air for delivering the compressed air into the flow passage through a narrow annular orifice formed in the internal surface of the unit and located upstream of the constriction of the venturi.

8. A drying method substantially as hereinbefore described with reference to the accompanying drawings.

9. A drying apparatus substantially as hereinbefore described with reference to the accompanying drawings.

10. Any novel feature or combination of features disclosed herein.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) — 12 —	Application number GB 9306963.1
Relevant Technical Fields (i) UK Cl (Ed.M) F4G (GFBD) (ii) Int Cl (Ed.5) F26B 5/00	Search Examiner A G SMITH Date of completion of Search 25 APRIL 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASE(S): WPI	Documents considered relevant following a search in respect of Claims :- 1-9

Categories of documents

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A:	Document indicating technological background and/or state of the art.	&:	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2231647 A	(H J HEINZ CO)	2
X	US 4777734	(ELFERINK)	1, 2
X	US 4017982	(GOFFREDO) see from line 58 in column 3 to line 3 in column 4 in particular	1, 2

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